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ABSTRACT

Forty-six elementary-aged, learning disabled students were rated by their teachers on a 23-item temperament questionnaire (TTQ) during the Fall and Spring of the academic year. Cognitive ability and achievement information (Woodcock-Johnson Psychoeducational Battery) were also collected during the first and last month of the school year. Posttest cognitive and achievement measures were regressed on pre-subtest performance and teacher ratings of student temperament. Results were interpreted to suggest that temperament indices (i.e., Task Orientation, Adaptability, and Reactivity) influenced performance on cognitive and achievement subtests controlling for IQ and variations in teacher rating styles. Task Orientation appeared particularly potent, influencing performance on those subtests requiring students to do more of something that they already knew how to do (e.g., simple arithmetic operations, match-to-sample discriminations). (Author)

Temperament Influences on Cognition and Achievement in Children with Learning Problems

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Running head: TEMPERAMENT

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Abstract

Forty-six elementary-aged, learning disabled students were rated by their teachers on a 23-item temperament questionnaire (TTQ) during the Fall and Spring of the academic year. Cognitive ability and achievement information (Woodcock-Johnson Psychoeducational Battery) were also collected during the first and last month of the school year. Posttest cognitive and achievement measures were regressed on pre-subtest performance and teacher ratings of student temperament. Results were interpreted to suggest that temperament indices (i.e., Task Orientation, Adaptability, and Reactivity) influenced performance on cognitive and achievement subtests controlling for IQ and variations in teacher rating styles. Task Orientation appeared particularly potent, influencing performance on those subtests requiring students to do more of something that they already knew how to do (e.g., simple arithmetic operations, match-to-sample discriminations).

Temperament Influences on Cognition and Achievement in Children with Learning Problems

Temperament is a within-person stylistic characteristic that interacts with teachers' instructional and management strategies to affect school performance (Thomas & Chess, 1977). While the notion that individual differences in personal or behavioral styles influence, perhaps even mediate, interactions between children and their environments is intuitively appealing, the impact of temperament on measured cognitive ability is unclear. Further, it is not known whether certain temperamental characteristics play a specific role in mediating positive or negative academic performance. The purpose of this study was to investigate the relationships between teacher temperament ratings and test determined IQ and teacher temperament ratings and academic achievement for children with learning problems.

Nowhere should the relationships among cognitive ability, academic achievement, and temperament be more pronounced than for cases involving children with learning problems. By definition, these children are most often described as having an IQ/Achievement discrepancy; that is, they tend not to achieve at levels commensurate with their measured academic ability (Hallahan & Bryan, 1981). One possible contributor to the IQ/Achievement discrepancy may be the interaction over time of teacher's instructional and classroom behaviors with children's behavioral styles. Where teachers are able to accommodate a wide range of

individual stylistic differences in their classrooms, it might be argued that the classroom environments are supportive of children's development. Thus, the opportunity for children to learn and to demonstrate that they have learned is enhanced. Where teachers are not accommodative, development (i.e., change over time) may be disrupted, straining children's abilities to process information, thus increasing the probability that the child will have problems learning. Stylistic variables, then, may help to describe the impact of individual differences on the failure to learn. In this regard, there should be a clear and persistent effect due to temperamental characteristics on measures of achievement and to a lesser extent on measures of cognitive ability for learning disabled children.

In a series of studies, Keogh and her colleagues (see Keogh 1983a and 1983b) have investigated the impact of children's temperament on their interpersonal and educational competence. Three major hypotheses have guided this research: 1) temperament patterns can be defined as a set of measureable, relatively stable individual difference variables; 2) adults and peers interacting with children perceive individual differences and thus are influenced by the nature of interpersonal interactions; and 3) explanations for the behavior and performance of children with handicaps in cognitive or physical development are more likely to be expressed as perceived variations in temperament than are the behavior and performance variations of non-handicapped children.

Measurement of Temperamental Characteristics

To measure temperament, Keogh and her colleagues chose the 64-item Teacher Temperament Questionnaire (TTQ) developed by Thomas and Chess (1977). While many techniques to assess temperamental variations in infants and young children have been developed (Rothbart, 1981), the TTQ was chosen by Keogh because it highlighted the influence of children's temperament on their interactions with adults. On the basis of an exploratory factor analysis (Keogh, Pullis, Cadwell, & Burstein, 1979), 23 items were selected from the original 64 items. The 23 items were those with the highest loadings on the three factors needed to capture most of the rating scale variance. In a subsequent study, Pullis and Cadwell (1982) reported results for a factor analysis of the 23 temperament items. Additionally, they examined correlations between the teachers' ratings of temperament and their ratings of more traditional student aptitudes (i.e., ability, motivation, social skills, etc.). Replicating previously reported findings, Pullis and Cadwell (1982) extracted three common factors accounting for 60% of the variance from their analysis of teacher ratings. A varimax rotation resulted in three independent temperament factors and yielded findings that were essentially identical to those reported by Keogh et al. (1979). The first factor, Task Orientation, reflected the students ability to remain seated during work activities, to persist on tasks until completion, and not to be distracted. Students scoring high on

the second factor, Adaptability, tended to react positively to new stimuli, to easily modify their behavior in response to routine changes, and to respond positively during social interactions. The last factor, Reactivity, refers to the student's tendency to overreact to stressful situations and to become overly upset when frustrated.

Internal item consistency within the three factor TTQ and sex and grade differences were also examined. When items were grouped within factors and tested for internal item consistency, alpha coefficients for Task Orientation, Adaptability, and Reactivity were .94, .88, and .62 respectively (Pullis, 1979). A test of factorial invariance, testing the assumption that the rating scale measures the same thing at different grade levels and across sex, supported the hypothesized three factor model (Cadwell & Pullis, 1983).

In sum, results of the psychometric analyses of the Teacher Temperament Questionnaire lend support to the contention that the 23-item short form is a reliable technique for assessing teacher's perceptions of children's temperament. The two forms (64- and 23-items) are factorially consistent; the factors have demonstrated internal consistency; agreement among raters is acceptably high; and the scores are consistent with expectations for age and sex of children. Moreover, teachers are able to use the scale efficiently (Keogh, Pullis, & Cadwell, 1982). Of note, the subscales Task Orientation, and Reactivity were not found to be

independent, however, these subscales had different patterns of correlation with other teacher estimates (e.g., motivation, academic performance, potential, and social interaction skills) (Pullis & Cadwell, 1982).

Temperament and Teacher Decisions

In addition to investigating the psychometric properties of the TTQ, work has also focused on studying the impact of children's temperament on teacher decisions. Using a policy capturing, regression-modeling approach developed by Shavelson, Cadwell, and Izu (1977), Pullis and Cadwell (1982) regressed teacher decisions in areas such as seatwork monitoring, small group activity monitoring, activity transition monitoring, freeplay activity monitoring, and placement recommendations onto student characteristics. Teachers' decision strategies were thus "captured." The most important finding reported by Pullis and Cadwell (1982) was that teachers relied heavily on temperament information when they had to make classroom management decisions. The contribution of temperament to the decision making process was evident even when controlling for ratings of ability, motivation, and social interaction skills. More specifically, children with negative temperament patterns are viewed as requiring more and specialized teacher supervision and direction. Moreover, while the type of temperament information (Task Orientation, Reactivity, Flexibility) is differentially important, the impact of Task Orientation appears most potent. In sum, results reported by

Cadwell and Pullis (1983), Keogh (1983b), and Pullis and Cadwell (1982) lend support to the contention that teacher's responses to children in classroom situations are mediated by their perceptions of the children's temperamental characteristics. Our general intent in collecting information for this study was to determine whether or not performance variance associated with measures of cognitive ability and classroom achievement could be accounted for by teacher ratings of student temperament. Simply stated, we were interested in whether and how stylistic variables impact on cognition and achievement for children with learning problems.

Method

Subjects. Subjects were 46 children from the core sample of the University of Virginia Learning Disabilities Research Institute (LDRI). The children attended one of four self-contained, experimental classrooms for LD pupils located in local elementary schools. Approximately 80% of the students were Caucasian; the remaining 20% were Black. All children were from lower to middle income families, based on parent occupation. All subjects were selected from a larger pool of pupils who met district eligibility standards for placement as learning disabled. District eligibility standards included an IQ/Achievement discrepancy criteria. Ability as determined by the WISC-R was: $\bar{X}$ = 98, σ = 13. The average discrepancy between WISC-R and PIAT or WRAT standard scores was approximately 19 points for reading and 18 points for math. Ages ranged from 86 to 138 months ($\bar{X}$ = 108,

σ = 14). The sample included 38 boys and 8 girls.

Student ability and achievement information (Woodcock-Johnson Psychoeducational Battery - Tests of Cognitive Ability [WJTCA] and Tests of Achievement [WJTA]) was collected during the first and last months of the school year. Teacher ratings of pupil characteristics were also collected during the first and last months of the school year.

Measures and Procedure. Four female teachers were asked to complete a 23-item temperament questionnaire for each of their students during the Fall and Spring of the academic year. Each item described a child's behavior in an educational setting. Responses indicating frequency of the occurring behavior ranged from hardly ever to almost always and were rated on a 6-point Likert scale. The 23 items were selected from the original 64-item Teacher Temperament Questionnaire (TTQ) developed by Thomas and Chess (1977). Factor analysis of the TTQ (Keogh, Pullis, & Cadwell, 1982) reduced the 64 items down to the 23 "best" items (i.e., those that had the largest factor loadings while maintaining the factor structure of the longer instrument). Pullis and Cadwell (1982) have demonstrated that the nine subscales supported by Thomas and Chess (1977) are not independent but can be grouped into three higher order temperament factors: Task Orientation, Adaptability, and Reactivity.

Data Analysis. Data analysis was conducted in two phases. First, the effect of temperament on each of the cognitive subtests

was examined. This was accomplished by generating 13 regression models, one model to examine each WJTCA subtest plus one model to examine the WJ full scale cognitive ability index. For each model, post-subtest performance was regressed on pre-subtest performance and teacher ratings of student temperament. (Note. Since data collected on students rated by the same teacher would not be independent, these analyses were conducted with deviation scores calculated by subtracting the teachers' mean rating over students from each individual student's score [Cronbach, 1976]). In order to control for teacher variation when comparing data across different teachers, the within-teacher correlation matrices were included as an independent variable in the regression equation. Thus, we were able to evaluate the relative contribution of temperamental characteristics controlling for teacher rating style and pretest performance. Second, the effect of temperament on the Woodcock-Johnson Tests of Achievement was examined. In this analysis, 14 regression models were generated, one for each of the 10 subtests and one for each of the four achievement factor clusters. Again, post-subtest performance was regressed on teacher rating variations, pre-subtest performance, and the temperamental composite variables (Task Orientation, Adaptability, and Reactivity).

Results

On the tests of cognitive ability, task orientation accounted for a significant portion of the variance in posttest performance

over and above teacher variability and pretest performance on three subtests, Spatial Relations, Quantitative Concepts, and Numbers Reversed. For the full scale score, only pretest performance accounted for a significant portion of the posttest variance, although ratings on the temperamental index, Adaptability, approached significance ($p < .12$). Table 1 summarizes the regression model effect analyses for the WJTCA.

Insert Table 1 about here

For the tests of achievement, a more variable relationship between temperament and posttest performance emerged. Task orientation accounted for significant portions of the posttest variance on the subtests Calculation, Applied Problems, and Proofing. Adaptability accounted for significant portions of posttest variance on subtests Letter-Word Identification and Social Studies. Finally, Reactivity made a significant contribution to posttest performance on the subtests Proofing, Science, and Social Studies. Table 2 summarizes the regression model effect analyzes for the WJTA.

Insert Table 2 about here

Discussion

Numerous analyses were conducted on the same data set, thus potential problems with Type I error merit cautious interpretation of the results. It should also be pointed out, however, that this is an exploratory study, hence, there is some need to speculate on possible relationships that might warrant further investigation. Where theoretical consistency or corroborative evidence supported the general direction of the analyses, we have interpreted alphas beyond the conventional .05 level of significance. While not wanting to overgeneralize the results, we do want to create opportunities for discussion in an area that is not well-understood.

Considering first the effect of temperament on cognitive ability, only task orientation appears to influence performance in the cognitive domain. Moreover, the effect was present on only three of the twelve cognitive subtests. By definition, Task Orientation reflects the student's ability to remain seated during work activities, to persist on tasks until completion, and not to be distracted. The finding then that increased task orientation resulted in improved performance on subtests Spatial Relations and Numbers Reversed was not surprising. Simply being more attentive and more persistent is likely to improve performance on these subtests. On the timed subtest, Spatial Relations, task oriented behavior would tend to improve performance by increasing the probability that a child would be able to make appropriate task

relevant discriminations. A review of student protocols corroborates this interpretation. Students tended not to make erroneous judgements about which components summed to the whole, rather their scores were limited by their inability to respond quickly. In general, it would appear that the effect of task orientation is most likely to be present where performance can be influenced by the child's ability to do more of something that the child already knows how to do (i.e., make simple match-to-sample discriminations) (Kneedler & Hallahan, 1981).

All classrooms from which sample students were drawn used the Corrective Reading and Language System programs (published by Science Research Associates). These programs place emphasis on teaching children to recall verbatim, information introduced in daily lessons. Coupled with increased task orientation, programmatic emphasis on specific recall of information might well account for improved performance on the subtest Numbers Reversed. Following this line of reasoning, however, one might also expect improvement on subtests such as Memory for Sentences and Visual Matching. In the case of Memory for Sentences, Task Orientation did approach significance ($p < .15$). For Visual Matching, however, there was no interpretable effect due to Task Orientation. Each of the remaining cognitive subtests on the WJTCA requires not only that the child be attentive but also that the child apply increasing amounts of strategic or general information in order to be successful. It was not surprising,

therefore, that increases in task oriented behavior did not result in improved performance on those subtests.

Shinn, Algozzine, Marston, and Ysseldyke (1980) reported that the cognitive subtest Quantitative Concepts has psychometric properties more similar to those of an achievement subtest than to those of a measure of cognitive ability. The finding that task orientation influences performance on Quantitative Concepts is consistent with results reported for the math achievement subtests. Task Orientation accounted for a significant portion of the posttest variance on subtests Calculations and Applied Problems. Apparently the relatively low performance on math related subtests by students showing increases in task orientation was due not only to limitations in knowledge but also to lack of persistence and/or distractibility. Increased task orientation at posttest resulted in students doing more of what they already knew how to do.

Two other findings deserve mention. First, we expected that there would be a general effect of temperament on achievement. This was not the case. For the Reading Achievement Cluster and for the individual reading subtests, there were no interpretable temperamental influences. This may have been due to the highly structured nature of the reading program. By design, the Corrective Reading Program constrains childrens' responses, thus minimizing the importance of individual differences during problem solving. As a result, increases in attentive, persistent behavior

are in keeping with program demands and individual differences in those behaviors tend not to be remarkable. Ostensibly, all children using this program are constrained to be more task oriented because of the response demands inherent to the program. In this way, children are rewarded by developing more complete skilled behaviors.

A second finding of interest was that both Task Orientation and Reactivity were important influences on posttest performance for the written language subtest, Proofing. Reactivity also affected performance on subtests Science and Social Studies. Reactivity refers to a student's tendency to become overly upset when frustrated. Findings here are consistent with the interpretation that perceived reductions in student frustration resulted in improved performance on subtests requiring the student to point out errors in written passages and to answer information items from the biological and physical sciences or from geography, government, and economics. General informational areas are often troublesome for children with learning problems. It seems reasonable, therefore, that any general or perceived reduction in frustration is likely to result in improved performance on items tapping these knowledge domains.

The educational implications to be drawn from this study are largely descriptive. Our goal was to document the influence of individual difference variables on cognitive ability and academic achievement. Given our findings, the next step would be to tackle

the question, "So what?" We have tried to make the case that temperament may influence performance, over and above IQ, on tasks measuring both cognitive ability and academic achievement. If individual difference variables like Task Orientation have an effect on ability and achievement, training children to be more task oriented and less reactive in the classroom should help establish a more supportive environment for the child. Ultimately, this may make it possible for the teacher to increase the amount of academic engaged time, a factor directly related to achievement.

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Table 1

Effect of Temperament on Changes in Cognitive Performance in Learning Disabled Pupils: Regression Model Summary

Dependent Variables	MSe	R^2	Predictor Variables: Pretest t	Pretest p<	Temperament: Task Orient t	Task Orient p<	Adaptability t	Adaptability p<	Reactivity t	Reactivity p<
Full Scale	48.12	.67	7.81	.00	.56	.58	1.61	.12	.50	.62
Pict Vocab	3.47	.74	9.01	.00	1.21	.23	.23	.82	.92	.36
Spa Rels	11.53	.71	5.29	.00	2.62	.01	.99	.33	.07	.94
Mem Sents	1.66	.72	8.14	.00	1.45	.15	.08	.93	.96	.34
V-A Lrng	70.77	.66	6.04	.00	.05	.96	.63	.53	.39	.70
Blending	10.23	.48	2.59	.01	.87	.39	.69	.49	1.34	.19
Quant Cons	9.00	.63	4.10	.00	2.51	.02	.28	.78	1.09	.28

Note. For all tested models, df = 37. This table does not include information from 4 teacher predictor variables entered into the analyses prior to the pretests.

Table 1 (Con't)

Effect of Temperament on Changes in Cognitive Performance in Learning Disabled Pupils: Regression Model Summary

			Predictor Variables							
					Temperament					
Dependent Variables	MSe	R^2	Pretest t	Pretest p<	Task Orient t	Task Orient p<	Adaptability t	Adaptability p<	Reactivity t	Reactivity p<
Vis Match	4.85	.58	5.09	.00	.32	.75	.17	.86	.51	.62
Ant-Syn	7.68	.71	8.02	.00	1.00	.32	1.16	.25	1.25	.22
Anl-Synth	13.30	.37	2.51	.02	1.04	.31	.12	.91	1.57	.12
Num Revr	2.92	.37	2.02	.05	2.20	.03	.60	.55	1.35	.19
Con Form	21.99	.55	4.93	.00	.36	.72	.01	.99	1.19	.24
Analogies	16.56	.30	1.60	.12	.98	.34	.20	.84	.82	.42

Note. For all tested models, df = 37. This table does not include information from 4 teacher predictor variables entered into the analyses prior to the pretests.

Table 2

Effect of Temperament on Changes in Achievement in Learning Disabled Pupils: Regression Model Summary

Dependent Variables	MSe	R^2	Predictor Variables: Pretest t	Pretest p<	Temperament: Task Orient t	Task Orient p<	Adaptability t	Adaptability p<	Reactivity t	Reactivity p<
Read Clus	36.46	.65	5.49	.00	.83	.41	.40	.69	.29	.77
Math Clus	79.81	.58	4.69	.00	1.68	.10	.86	.39	.92	.36
Writ Lang Clus	37.56	.60	4.45	.00	.65	.52	.52	.61	.93	.36
Know Clus	42.42	.80	10.94	.00	.08	.94	2.16	.04	2.37	.02
L-W Ident	7.56	.81	6.65	.00	.21	.83	.30	.77	.96	.34
Word Attack	7.42	.62	4.11	.00	.54	.59	2.09	.04	1.00	.32
Pass Comp	4.26	.71	5.42	.00	.05	.96	.53	.60	.65	.52

Note. For all tested models, df = 37. This table does not include information from 4 teacher predictor variables entered into the analyses prior to the pretests.

Table 2 (Con't)

Effect of Temperament on Changes in Achievement in Learning Disabled Pupils:

Regression Model Summary

			Predictor Variables							
							Temperament			
Dependent			Pretest		Task Orient		Adaptability		Reactivity	
Variables	MSe	R^2	t	p<	t	p<	t	p<	t	p<
Calculation	6.68	.73	4.68	.00	2.76	.01	1.18	.24	1.50	.14
Appl Probs	7.35	.62	3.37	.00	1.61	.12	1.38	.18	1.25	.22
Dictation	4.26	.81	8.24	.00	.61	.54	.34	.74	.91	.37
Proofing	6.94	.60	2.05	.05	2.77	.01	1.40	.17	1.87	.07
Science	3.35	.81	9.81	.00	1.24	.22	1.55	.13	4.59	.00
Soc Studies	4.64	.69	7.02	.00	.77	.45	1.75	.09	1.96	.06
Humanities	7.69	.61	6.33	.00	.34	.73	1.05	.30	.93	.36

Note. For all tested models, df = 37. This table does not include information from 4 teacher predictor variables entered into the analyses prior to the pretests.